RECEIVED
CENTRAL FAX CENTER
MAR 0 5 2007

REMARKS

Independent claims 1 and 6 have each been amended to more particularly claim the subject matter that the applicants regard as their invention by reciting that the protective layer on the surface of the heating element consists essentially of Al_2O_3 and that the layer does not peel from the surface of the heating element under thermal cycling between room temperature and about 1500°C.

Claims 1, 4 through 6, 8 and 9 were rejected as obvious based upon a combination of the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 reference. With respect to Schrewelius '145, the examiner acknowledged that that reference did not disclose "the production of Al_2O_3." Additionally, that reference also does not disclose SiO_2 of at least 98% purity. However, and very significantly, the Schrewelius '145 reference also does not disclose the claimed molybdenum aluminum silicide material. Instead, in reciting the thermocouple composition in the form $(Mo_{1-y}\ M_y)\ (Si_{1-x}\ Al_x)_2$ it identifies the metal M as one or more of "Ti, Zr, Hf, Ta, Nb, V, W or Cr." (See Schrewelius '145, col. 1, lines 69-70). And in the only example provided in that reference, it discloses an alloy having a considerably different composition, namely $(Mo_{0.7}Ti_{0.3})(Si_{0.8}Al_{0.2})$. It does not disclose molybdenum aluminum silicide mixed in combination with SiO_2 having at least 98% purity. It also does not indicate any recognition of a peeling Al_2O_3 layer when subjected to thermal cycling, nor does it mention thermal cycling. Additionally, and very significantly, it teaches the use of bentonite for both the positive leg of the thermocouple (see Schrewelius '145,

col. 3, line 3) as well as for the negative leg of the thermocouple (see Schrewelius '145, col. 3, line 15). The SiO_2 content of bentonite is of the order of about 60-70% (paragraph 0011 of the present application), which is markedly less than the 98% recited in clams 1 and 6. Moreover, the present invention teaches in paragraph 0022 of the specification to substitute silicon dioxide for bentonite to avoid the impurities that are contained in bentonite. Thus, the Schrewelius '145 teaches away from the present invention by leading one having only ordinary skill in the art to use bentonite, not 98% pure SiO_2 as claimed, and not to use molybdenum aluminum silicide, also as claimed.

The Schrewelius '959 reference was cited and relied upon for showing a molybdenum silicide heating element in which Al_2O_3 is formed. However, there is no disclosure in that reference of an outer surface layer of Al_2O_3. Instead, the Al_2O_3 is disclosed merely as a constituent that reacts with SiO_2 to stop grain growth of the silicate. Although that reference mentions Al_2O_3, it does so only in the context of a constituent that reacts with SiO_2 to form a glass phase. Importantly, that reference does not disclose or even suggest an Al_2O_3 surface layer, but instead it repeatedly refers to an outer surface layer of quartz glass (see, e.g., Schrewelius '959 at col. 1, lines 20-23; col. 2, lines 41-50 and lines 67-71; col. 3, lines 1-2; col. 4, line 38; col. 5, lines 44-48; and col. 8, lines 70-71). The quartz glass outer layer serves to limit high temperature oxidation (see Schrewelius '959 at col. 2, lines 48-50) and stops grain growth (see Schrewelius '959, col. 6, lines 5-7). Moreover, the composition disclosed at the bottom of column 5 of that reference includes the types of impurities that are characteristic

of bentonite clay, which the inventors have discovered leads to a peelable outer oxide layer, and which is overcome in the present invention by providing SiO_2 of at least 98% purity. The Schrewelius '959 reference also does not indicate any recognition of the problem of a peeling Al_2O_3 outer layer when a heating element is subjected to thermal cycling, nor does it teach or even suggest a solution to that problem.

The Sekhar et al. '399 reference was cited for disclosing pure SiO_2 in the context of an electrical heating element. But that reference relates to different materials and different compositions. In fact, there is no mention at all in that reference of the major constituent in the composition of the claimed invention, which is $Mo(Si_{1-x}\ Al_x)_2$. It also does not indicate any recognition of a peeling Al_2O_3 layer when subjected to thermal cycling. Instead, the Sekhar et al. '399 reference is directed to a different problem, that of providing oxidation resistance (see Sekhar et al. '399, col. 1, lines 39-44).

In addition to the differences in materials and in the problems to which the relied-upon references are directed, as noted above between the individual references and the claimed invention, there are no disclosures in any of the references relied upon that would motivate one having only ordinary skill in the art to combine them in any way at all, let alone to arrive at the claimed invention. Because the problem addressed by the present invention is not mentioned in and is different from the problems addressed by the references, one of only ordinary skill in the art would not be led to those references for a solution to the problem of the peeling of an Al_2O_3 outer surface layer.

Additionally, even if one were to consider the references relied upon, is not apparent from the references just which parts of which reference should be combined with which parts of the other references and which parts of the references should be ignored or discarded. Indeed, it appears that the only motivation for even selecting the references, and then combining them in a particular way is the present disclosure. But it is improper to use as a road map or a template an inventor's disclosure in order to use against him that which only he has disclosed.

Additionally, each of independent claims 1 and 6 clearly recites an Al_2O_3 protective outer surface layer that does not peel under thermal cycling between room temperature and about 1500°C. None of the references relied upon discloses or suggests an Al_2O_3 outer surface layer, nor do any of the references even mention or appreciate the problem to which the present invention is directed – the peeling of a surface layer of Al_2O_3 upon subjection to thermal cycling of a heating element having such a surface layer. Thus, whether the references are considered alone or together, neither the individual references nor any attempted combination of them teaches or suggests the invention as it is claimed in either of claims 1 and 6.

Claims 4 through 6, 8, and 9 each depend from one of amended claim 1 or amended claim 6, either directly or indirectly, and therefore the same distinctions as are noted above in connection with claims 1 and 6 apply with equal effect to those dependent claims. Further, the dependent claims contain

additional recitations that further distinguish the invention as so claimed from the teachings of the references relied upon.

Claims 2 and 10 were rejected as obvious based upon the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 reference, and in view of the Chyung et al. '091 reference. The Chyung et al. '091 reference was cited merely for a disclosure of mullite. However, the Chyung et al. '091 reference also lacks the claimed features that are noted in the discussion above relative to the other references that were relied upon. Accordingly, the addition of that reference to the combination asserted in connection with claim 1 still does not teach or suggest the invention as claimed in amended claim 1, from which each of claims 2 and 10 depend. Again, however, there are no disclosures in any of the references relied upon that would lead one having only ordinary skill in the art to combine them in any way at all, let alone to arrive at the claimed invention. And it is not apparent from the references just which parts of which reference should be combined with which parts of the other references and which parts of the references should be ignored or discarded. Indeed, it appears that the only motivation for even selecting the references and then combining them in a particular way is the present disclosure. But it is improper to use as a road map or a template an inventor's disclosure in order to use against him that which only he has disclosed.

Claim 11 was rejected as obvious based upon the combination of the Schrewelius '145 and '959 references, together with the Sekhar et al. '399 and the Chyung et al. '091 references, in view of the Sawamura et al. '215 reference.

The Sawamura et al. '215 reference was cited for disclosing sillimanite. But that reference also lacks the teaching or suggestion of the factors discussed above in connection with the other references. Therefore, even if the Sawamura et al. '215 reference were to be combined with the other references relied upon, that combination still does not teach or suggest the invention as claimed in claim 1, from which claim 11 indirectly depends.

Based upon the foregoing amendments and remarks, the claims as they now stand in the application are believed clearly to be in allowable form in that they patentably distinguish over the disclosures contained in the references that were cited and relied upon by the examiner, whether those references be considered alone or together. Consequently, this application is believed now to be in condition for allowance, and reconsideration and reexamination of the application is respectfully requested with a view toward the issuance of a Notice of Allowance.

The examiner is cordially invited to telephone the undersigned attorney if this amendment raises any questions, so that any such question can be quickly resolved in order that the present application can proceed toward allowance.

The courtesy of an interview is requested, and the examiner is invited to telephone the undersigned after he has considered this amendment.

Respectfully submitted,

March 5, 2007

Alfred J. Mangels
Reg. No. 22,605
4729 Cornell Road
Cincinnati, Ohio 45241
Tel.: (513) 469-0470